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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the lubricating oil which has high thermal stability, the low pour point, a high oil film property, and biodegradability especially about the lubricating oil which can be used suitable for engine oil, such as a lubricating oil for the lubricating oil for rolling, a two cycle, and four cycles, industrial use gear oil, hydraulic fluid, the lubricating oil for fiber, etc.
[0002]
[Description of the Prior Art] In recent years, with rapid development of various machine industry, the service condition of a lubricating oil has made it severe, and the lubricating oil which has outstanding lubricating properties has come to be required.
[0003] For example, in rolling oil, it is remarkable, the request to rolling oil is diversified, and, for this reason, the advance of a sheet metal steel plate manufacturing technology has been changed into the synthetic oil system from the conventional mineral oil system and the fats-and-oils system. Moreover, from the standpoint of environmental manipulation, a mill, dirt prevention of a facility of rolling oil, and reduction of fume are called for, therefore the formation of a low-melt point point of rolling oil and low concentration-ization are called for, and large lubricative improvement is pursued also for sheet metal and rolling.
[0004] However, workability is bad, although it is still mixed stock with mineral oil and natural oil fat in the synthetic oil (for example, JP,3-172392,A) used at the present stage, therefore lubricity is good. That is, that low-melt point point-ization is not progressing and since the straight chain-like high-class saturated fatty acid monocarboxylic acid of carbon numbers 12-18 is contained in rolling oil, and straight chain-like unsaturated fatty acid monocarboxylic acid is contained further, there is a problem that thermal stability is bad. Thus, the present condition is that there is no rolling oil with which are satisfied of still high thermal stability, a low fluidity, and a high oil film property.
[0005] On the other hand, in engine oil, a military requirement also becomes severe much more by improvement in the speed of an automobile, and expansion of a highway, and the demand to a high increase in power is becoming severe every year. Furthermore, on the other hand by the equipment of a purge etc., it is becoming difficult by the engine performance of the conventional automobile engine oil to fill these demands. others, such as thermal stability which was excellent as engine performance required of a future automobile engine oil, cold-temperature fluidity, low-temperature startability, sludge dispersibility, and wear prevention, -- the life of engine oil, i.e., extension-izing of a change-of-the-oil term, -- or -- unnecessary -- it is-izing and reduction-izing of the various additives to engine oil or unnecessary-ization is demanded further.
[0006] Conventionally, as a lubricating oil of the high performance for rolling oil or engine oil, the ester system lubricating oil is proposed, neopentyl polyol is used as a component of the polyhydric alcohol in ester, and using ten or less straight chain-like saturated fatty acid monocarboxylic acid as a fatty-acid component, a carbon number with a comparatively small carbon number mixes this to straight mineral oil as these neopentyl polyol esters, and is using it for an internal combustion engine as an automobile

engine oil (JP,46-6528,A, JP,48-27867,A, JP,50-11685,A, etc.).
[0007] It is known that the lubricating oil which used these neopentyl polyol ester as the base is excellent in heat and oxidation stability as compared with conventional mineral oil and common ester oil. There is an example actually used for the application field which employed this property efficiently as base oils, such as grease, hydraulic oil, metalworking fluid (rolling oil), and engine oil, or an additive.

[0008] However, although the neopentyl polyol ester is excellent in heat and oxidation stability in this way as compared with other ester system lubricating oils, on the other hand, it is still inadequate about the cold-temperature fluidity which is a property important as the lubricating oil base, and greatly inferior as compared with diester oils, such as dioctyl sebacate (DOS). Moreover, the conventional neopentyl polyol ester lacked in versatility for this fault. Furthermore, also about lubricity, since the alkyl chain length of the fatty acid which constitutes ester was fluid maintenance, constraint had to be received, and the with a carbon number of ten or less thing had to be used for the subject. For this reason, it was inadequate also about lubricity and oiliness.
[0009] Moreover, in order to lower the pour point and to raise lubricity, the neopentyl polyol ester (JP,59-133297,A) using the oleic acid which lengthens alkyl chain length and has a double bond is proposed, but since it has a double bond, there is a problem that heat and oxidation stability are inferior.
[0010] Furthermore, the lubricating oil aiming at workability being high and cleaning nature (water solubility) being good is proposed about the metalworking fluid agent and the metalworking approach (JP,4-20598,A).
[0011] This lubricating oil blends polyether polyol fatty acid ester, alkali, or amine soap with a straight chain olefin as an emulsifier.
[0012] However, since polyether polyol fatty acid ester is used as an emulsifier and is using the olefin by this proposal, biodegradability is bad and is not desirable from an environmental side.
[0013] in addition, the ester system lubricating oil about the object for refrigerators which uses 1, 1, 1, and 2-tetrafluoro ethane refrigerant is proposed -- **** (JP,4-146995,A) -- although this proposal has compatibility with a refrigerant, and the description of low hygroscopicity, it does not have the fully satisfied engine performance.
[0014] This invention is excellent in cold-temperature fluidity and lubricity, and aims at offering the high performance lubricating oil used suitable for rolling oil, engine oil, etc. while it was made in view of the above-mentioned situation and is excellent in thermal stability and oxidation stability.
[0015]
[Means for Solving the Problem and its Function] In order that this invention person may attain the above-mentioned purpose, as a result of repeating examination wholeheartedly, the neopentyl polyol of 2 to which at least beta in a molecule does not have a hydrogen atom in carbon as a component of polyhydric alcohol - 6 ** is used. The lubricating oil which used the polyether polyol fatty acid ester obtained by esterifying what added 1-10 mols of alkylene oxide radicals to this with the fatty acids of carbon numbers 8-22 as a lubricating oil component While excelling in thermal stability and oxidation stability, cold-temperature fluidity, lubricity, and by excelling in biodegradability further and moreover controlling the number of addition mols of alkylene oxide It can be made to change freely according to an application, an application finds out that it is a large high performance lubricating oil, and kinematic viscosity also comes to make this invention.
[0016] Therefore, this invention offers the lubricating oil containing the polyether polyol fatty acid ester obtained by esterifying what added 8-10 mols of alkylene oxide radicals to the neopentyl polyol of 2 to which at least beta in a molecule does not have a hydrogen atom in carbon - 6 ** with the fatty acids of carbon numbers 8-22.
[0017] The polyhydric alcohol which will be used in order to obtain the polyether polyol fatty acid ester used for the lubricating oil of this invention if it explains in more detail about this invention hereafter is the neopentyl polyol of 2 to which at least beta in the molecule does not have a hydrogen atom in carbon - 6 **, for example, can mention neopentyl glycol, trimethylolethane, trimethylol propane, TORIMECHI roll butane, a TORIMECHI roll hexane, a ditrimethylol propane, pentaerythritol,

dipentaerythritol, etc., it is independent in these one sort, or two or more sorts can be mixed and used for it.

[0018] Moreover, as alkylene oxide used for addition, it is independent in one sort, such as ethyleneoxide, propylene oxide, isopropanal pyrene oxide, butylene oxide, and isobutylene oxide, or two or more sorts can be mixed and used. The range of the 1-10 mols of the numbers of addition mols is 3-10 mols preferably to polyhydric alcohol. If there are few addition mols than one mol, the effectiveness of addition will not be discovered, and oxidation stability is inferior when [than 11 mols] more. In addition, in case two or more sorts of alkylene oxide is added, a block target or a random target is sufficient.

[0019] the fatty acids used for esterification on the other hand -- carbon numbers 8-22 -- it is the thing of 11-18 preferably, and even if it is a straight chain-like and is a letter of branching, it does not interfere. The load carrying capacity of a request of a carbon number in seven or less thing is not obtained, and cold-temperature fluidity is not improved for a carbon number or more by 23. As fatty acids of such carbon numbers 8-22, a caprylic acid, a capric acid, undecanoic acid, a lauric acid, a myristic acid, a palmitic acid, isostearic acid, oleic acid, arachidic acid, behenic acid, and these low-grade alkyl ester can be mentioned, for example. In addition, low-grade alkyl has a desirable thing to carbon numbers 1-4.

[0020] Although the lubricating oil of this invention uses the above-mentioned polyether polyol fatty acid ester as a principal component, it can blend an extreme pressure agent, a detergent dispersant, a fluid depressant, an oxidation stabilizer, etc. as occasion demands.

[0021]

[Effect of the Invention] Compared with the conventional lubricating oil, lubricating properties, cold-temperature fluidity, and heat and oxidation stability are improved remarkably, and metalworking fluid, fire resistant fluid besides the lubricating oil for engine oil, grease, etc. can be broadly used for the lubricating oil by this invention suitably as an industrial use lubricating oil taking advantage of this description.

[0022]

[Example] Although an example and the example of a comparison are shown and this invention is shown concretely hereafter, this invention is not restricted to the following example.

[0023] Polyether polyol fatty acid ester was manufactured using the polyhydric-alcohol alkylene oxide addition product and fatty acid ester which were shown in the following table 1. Among these, the manufacture approach of an example 2, an example 3, and an example 5 is shown below.

[0024] 80g [of three mol addition products of trimethylol propane ethyleneoxides] (0.296 mols), 198.6g [of methyl caprates] (1.066 mols), and sodium methylate 1.4g (0.5 % of the weight of opposite preparations) was put into the glass reactor with a capacity of 500ml which attached the <example 2> reflux capacitor, the thermometer, and the agitator, and it was made to react to it by 220 degrees C and 110torr for 6 hours. After 112g water's having washed twice after reaction termination and removing a catalyst, the topping of the residual methyl caprate was carried out by 220 degrees C and 0.3torr, the system of reaction was filtered, and the yellow transparence liquid of 213g of polyether polyol fatty acid ester (98% of yield) was obtained.

[0025] 70g [of three mol addition products of trimethylol propane propylene oxide] (0.226 mols), 150.9g [of methyl caprates] (0.81 mols), and sodium methylate 1.1g (0.5 % of the weight of opposite preparations) was put into the glass reactor with a capacity of 500ml which attached the <example 3> reflux capacitor, the thermometer, and the agitator, and it was made to react to it by 90 degrees C and 9torr for 4 hours. After 100g water's having washed twice after reaction termination and removing a catalyst, the topping of the residual methyl caprate was carried out by 220 degrees C and 2torr, the system of reaction was filtered, and the yellow transparence liquid of 170g of polyether polyol fatty acid ester (98% of yield) was obtained.

[0026] 70g [of three mol addition products of trimethylol propane propylene oxide] (0.226 mols), 173.3g [of methyls laurate] (0.81 mols), and sodium methylate 1.2g (0.5 % of the weight of opposite preparations) was put into the glass reactor with a capacity of 500ml which attached the <example 5> reflux capacitor, the thermometer, and the agitator, and it was made to react to it by 90 degrees C and

5torr for 4 hours. After 100g water's having washed twice after reaction termination and removing a catalyst, the topping of the residual methyl laurate was carried out by 220 degrees C and 1torr, the system of reaction was filtered, and the yellow transparence liquid of 187g of polyether polyol fatty acid ester (97% of yield) was obtained.

[0027]

[Table 1]

		多価アルコール	アルキレンオキサイド		脂肪酸エステルの種類
			EO	PO	
実施例	1	トリメチロールプロパン	3	0	カプリル酸メチル (C8)
	2	トリメチロールプロパン	3	0	カプリン酸メチル (C10)
	3	トリメチロールプロパン	0	3	カプリン酸メチル (C10)
	4	トリメチロールプロパン	0	3	ウンデカン酸メチル (C11)
	5	トリメチロールプロパン	0	3	ラウリン酸メチル (C12)
	6	トリメチロールプロパン	0	3	ミリスチン酸メチル (C14)
	7	トリメチロールプロパン	0	7	パルミチン酸メチル (C16)
	8	トリメチロールプロパン	0	8	ステアリン酸メチル (C18)
	9	トリメチロールプロパン	3	0	オレイン酸メチル (C18F1)
	10	トリメチロールプロパン	0	10	アラキジン酸メチル (C20)
	11	ネオペンチルグリコール	0	3	ラウリン酸メチル (C12)
	12	ペンタエリスリトール	0	3	ラウリン酸メチル (C12)
比較例	1	トリメチロールプロパン	3	0	ブチル酸メチル (C4)
	2	トリメチロールプロパン	0	0	カプリン酸メチル (C10)
	3	トリメチロールプロパン	0	0	ラウリン酸メチル (C12)
	4	トリメチロールプロパン	0	11	ラウリン酸メチル (C12)
	5	トリメチロールプロパン	0	0	オレイン酸メチル (C18F1)
	6	トリメチロールプロパン	0	10	トリコサン酸メチル (C23)

[0028] According to the following approach, kinematic viscosity, a viscosity index, the pour point, coefficient of friction, withstand-load ability, the hot tube trial, and the oxidation stability trial were performed about the polyether polyol fatty acid ester obtained in the example shown in Table 1, and the example of a comparison. In addition, as rolling oil, the value of the pour point, coefficient of friction, withstand-load ability, and an oxidation stability trial is important, and the value of a viscosity index, the pour point, coefficient of friction, withstand-load ability, a hot tube trial, and an oxidation stability trial is important as engine oil. A result is shown in Tables 2 and 3.

<test-method> kinematic viscosity JIS K2269 -- a conformity Coefficient-of-friction :pendulum mold-lubricant nature friction tester specification -- conformity withstand-load ability [ ] -- :JIS K2519 -- conformity hot tube trial: -- test-temperature: -- 300 degrees C, test time 16 hours, and air-flow-rate 10**0.5 cc/min trial oil flow rate:0.31**0.01 cc/min oxidation stability trial:JIS K2514 -- conformity : JIS [0029] K2283 -- conformity viscosity index : JIS K2283 -- the conformity pour point :

[Table 2]

試験項目			実施例					
			1	2	3	4	5	6
動粘度		100℃	5.30	6.06	6.70	7.46	8.16	9.60
		40℃	25.0	28.30	34.07	38.83	43.60	53.70
粘度指数			151	169	158	162	164	166
流動点 (℃)			−42.5	−37.5	<−50.0	−42.5	−20.0	−10.0
摩擦係数			0.13	0.13	0.12	0.12	0.12	0.13
耐荷重能 (MPa)			0.196	0.196	0.196	0.245	0.245	0.245
ホットチューブ試験			9.0	9.0	9.0	9.0	8.5	9.0
酸化安定性試験	増酸価	24h	9.4	9.5	9.4	9.4	9.6	9.7
		48h	17.6	17.5	17.0	17.3	17.9	17.2
	粘度比	24h	0.95	0.90	0.98	0.94	0.90	0.99
		48h	0.96	0.94	0.97	0.96	0.93	0.97

試験項目			実施例					
			7	8	9	10	11	12
動粘度		100℃	11.11	12.50	10.68	14.21	5.33	12.71
		40℃	64.7	76.30	60.27	90.12	25.10	76.70
粘度指数			157	162	168	163	153	158
流動点 (℃)			−5.0	−5.0	−45.0	−2.5	−40.0	−2.5
摩擦係数			0.12	0.14	0.13	0.13	0.12	0.11
耐荷重能 (MPa)			0.245	0.245	0.245	0.245	0.245	0.245
ホットチューブ試験			9.0	9.0	7.0	9.0	9.0	9.0
酸化安定性試験	増酸価	24h	9.5	9.8	9.0	9.5	9.4	9.5
		48h	17.1	17.4	15.4	17.8	17.5	17.4
	粘度比	24h	0.91	0.93	1.92	0.97	0.99	0.91
		48h	0.95	0.98	3.15	0.99	0.99	0.98

[0030]
[Table 3]

試験項目			比較例					
			1	2	3	4	5	6
動粘度		100℃	4.03	5.20	5.67	10.12	9.94	17.34
		40℃	17.92	24.60	33.40	56.25	49.37	110.97
粘度指数			125	148	161	170	193	172
流動点 (℃)			<−50.0	−20.0	2.5	−7.5	−37.5	10.0
摩擦係数			0.15	0.15	0.15	0.13	0.12	0.14
耐荷重能 (MPa)			0.147	0.196	0.196	0.245	0.196	0.245
ホットチューブ試験			9.0	9.0	9.0	5.0	2.0	8.5
酸化安定性試験	増酸価	24h	8.9	8.9	9.1	9.4	8.8	9.0
		48h	17.0	17.0	17.7	17.0	13.7	17.4
	粘度比	24h	1.3	1.3	1.6	3.5	3.9	0.96
		48h	1.8	1.8	2.0	8.7	10.3	0.97

[0031] From the result of Tables 2 and 3, if the lubricating oil of this invention compares the examples 2 and 3 using the same polyhydric alcohol and the same saturated fatty acid, the example 1 of a comparison, and an example 5 and the example 2 of a comparison [the lubricating oil of the example of a comparison], respectively, when it will introduce an alkylene group clearly, it is admitted that the pour point becomes low and shows a hyperviscous characteristic and high withstand-load ability. Moreover, high thermal resistance (hot tube trial) and anti-oxidation stability are shown, and, for this reason, it is admitted that the lubricating oil of this invention has the property which was excellent as rolling oil and engine oil.

[Translation done.]